

CLAIMS

What is claimed is:

1. A PTH analogue or a truncated PTH analogue or a pharmaceutically acceptable salt thereof that selectively binds to the PTH2 receptor.
- 5 2. A PTH analogue or a truncated PTH analogue or a pharmaceutically acceptable salt thereof according to claim 1 where said analogue is a selective PTH2 receptor agonist.
- 10 3. A PTH analogue or a truncated PTH analogue or a pharmaceutically acceptable salt thereof according to claim 1 where said analogue is a selective PTH2 receptor antagonist.
- 15 4. A method of selectively binding a PTH2 receptor which comprises administering to a patient in need thereof an effective amount of an analogue according to claim 1 or a pharmaceutically-acceptable salt thereof.
- 20 5. A method of selectively eliciting an agonist response from the PTH2 receptor which comprises administering to a patient in need thereof an effective amount of an analogue according to claim 2 or a pharmaceutically acceptable salt thereof.
- 25 6. A method of selectively eliciting an antagonist response from the PTH2 receptor which comprises administering to a patient in need thereof an effective amount of an analogue according to claim 3 or a pharmaceutically acceptable salt thereof.
7. An analogue according to claim 1 wherein said analogue is of formula (I),
(R¹R²)-A¹-A²-A³-A⁴-A⁵-A⁶-A⁷-A⁸-A⁹-A¹⁰-A¹¹-A¹²-A¹³-A¹⁴-A¹⁵-A¹⁶-A¹⁷-A¹⁸-A¹⁹-A²⁰-A²¹-A²²-A²³-
25 A²⁴-A²⁵-A²⁶-A²⁷-A²⁸-A²⁹-A³⁰-A³¹-A³²-A³³-A³⁴-A³⁵-A³⁶-A³⁷-A³⁸-R³ ,
(I)
or a pharmaceutically-acceptable salt thereof wherein
A¹ is a hydrophilic or a lipophilic amino acid;
A² is a lipophilic amino acid;
30 A³ is a hydrophilic or a lipophilic amino acid;
A⁴ is a hydrophilic amino acid;
A⁵ is a hydrophilic or a lipophilic amino acid;
A⁶ is a hydrophilic amino acid or is deleted;
A⁷ is a hydrophilic or a lipophilic amino acid or is deleted;
35 A⁸ is a lipophilic amino acid or is deleted;

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A⁹ is a hydrophilic amino acid or is deleted;
A¹⁰ is a hydrophilic amino acid or is deleted;
A¹¹ is a hydrophilic or a lipophilic amino acid or is deleted;
A¹² is a hydrophilic or a lipophilic amino acid or is deleted;
5 A¹³ is a hydrophilic amino acid;
A¹⁴ is a hydrophilic amino acid or is deleted;
A¹⁵ is a lipophilic amino acid or is deleted;
A¹⁶ is a hydrophilic or a lipophilic amino acid or is deleted;
A¹⁷ is a hydrophilic or a lipophilic amino acid or is deleted;
10 A¹⁸ is a lipophilic amino acid or is deleted;
A¹⁹ is a hydrophilic or a lipophilic amino acid or is deleted;
A²⁰ is a hydrophilic amino acid or is deleted;
A²¹ is a hydrophilic or a lipophilic amino acid or is deleted;
A²² is a lipophilic or a hydrophilic amino acid or is deleted;
15 A²³ is a hydrophilic or a lipophilic amino acid;
A²⁴ is a hydrophilic or a lipophilic amino acid;
A²⁵ is a hydrophilic amino acid;
A²⁶ is a hydrophilic amino acid;
A²⁷ is a lipophilic or a hydrophilic amino acid;
20 A²⁸ is a lipophilic amino acid;
A²⁹ is a lipophilic or a hydrophilic amino acid;
A³⁰ is a hydrophilic or a lipophilic amino acid;
A³¹ is a lipophilic or a hydrophilic amino acid or is deleted;
A³² is a hydrophilic amino acid or is deleted;
25 A³³ is a hydrophilic amino acid or is deleted;
A³⁴ is a lipophilic amino acid or is deleted;
A³⁵ is a lipophilic amino acid or is deleted;
A³⁶ is a lipophilic or a hydrophilic amino acid or is deleted;
A³⁷ is a lipophilic amino acid or is deleted;
30 A³⁸ is a lipophilic or a hydrophilic amino acid or is deleted;

R¹ and R² are each independently selected from the group consisting of H, (C₁₋₃₀)alkyl, (C₂₋₃₀)alkenyl, phenyl-(C₁₋₃₀)alkyl, naphthyl(C₁₋₃₀)alkyl, hydroxy(C₁₋₃₀)alkyl, hydroxy(C₂₋₃₀)alkenyl, hydroxy-phenyl(C₁₋₃₀)alkyl or hydroxy-naphthyl(C₁₋₃₀)alkyl;

or one of R¹ or R² is COE¹ where E¹ is (C₁₋₃₀)alkyl, (C₂₋₃₀)alkenyl, phenyl(C₁₋₃₀)alkyl, naphthyl(C₁₋₃₀)alkyl, hydroxy(C₁₋₃₀)alkyl, hydroxy(C₂₋₃₀)alkenyl, hydroxy-phenyl(C₁₋₃₀)alkyl or hydroxy-naphthyl(C₁₋₃₀)alkyl; and

5 R³ is OH, NH₂, (C₁₋₃₀)alkoxy or NH-Y-CH₂-Z, where Y is a (C₁₋₃₀) hydrocarbon moiety and Z is CO₂H or CONH₂;

provided that the compound is not PTH(1-34)R³, PTH(1-35)R³, PTH(1-36)R³, PTH(1-37)R³, or PTH(1-38)R³.

8. A method of selectively binding a PTH2 receptor which comprises administering to a patient in need thereof an effective amount of an analogue 10 according to claim 7 or a pharmaceutically-acceptable salt thereof.

9. An analogue according to claim 1 of formula (II),

(R¹R²)-A¹-A²-A³-A⁴-A⁵-A⁶-A⁷-A⁸-A⁹-A¹⁰-A¹¹-A¹²-A¹³-A¹⁴-A¹⁵-A¹⁶-A¹⁷-A¹⁸-A¹⁹-A²⁰-A²¹-A²²-A²³-A²⁴-A²⁵-A²⁶-A²⁷-A²⁸-A²⁹-A³⁰-A³¹-A³²-A³³-A³⁴-A³⁵-A³⁶-A³⁷-A³⁸-R³,

(II)

15 or a pharmaceutically-acceptable salt thereof wherein

A¹ is Ser, Ala, Dap, Thr, Aib or is deleted;

A² is Val, Leu, Ile, Phe, Nle, β -Nal, Aib, p-X-Phe, Acc, Cha, Met or is deleted;

A³ is Ser, Thr, Aib or is deleted;

A⁴ is Glu, Asp or is deleted;

20 A⁵ is Leu, Val, Nle, Ile, Cha, β -Nal, Trp, Pal, Acc, Phe, p-X-Phe or is deleted;

A⁶ is Gln, a hydrophilic amino acid or is deleted;

A⁷ is Leu, Val, Nle, Ile, Cha, β -Nal, Trp, Pal, Acc, Phe, p-X-Phe, a lipophilic amino acid, or is deleted;

A⁸ is Met, Nva, Leu, Val, Ile, Cha, Acc, Nle, p-X-Phe, Phe, β -Nal, Bpa, a lipophilic amino acid or is deleted;

A⁹ is His, a hydrophilic amino acid or is deleted;

A¹⁰ is Asn, a hydrophilic amino acid or is deleted;

A¹¹ is Leu, Val, Nle, Ile, Cha, β -Nal, Trp, Pal, Acc, Phe, p-X-Phe, a hydrophilic amino acid or is deleted;

30 A¹² is Gly, Acc, Aib, or is deleted;

A¹³ is Lys, Arg or HN-CH((CH₂)_nNH-R⁴)-C(O);

A¹⁴ is His or is deleted;

A¹⁵ is Leu, Val, Nle, Ile, Cha, β -Nal, Trp, Pal, Acc, Phe, p-X-Phe or is deleted;

A¹⁶ is Ser, Asn, Ala, Aib or is deleted;

35 A¹⁷ is Ser, Thr, Aib or is deleted;

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A¹⁸ is Met, Nva, Leu, Val, Ile, Nle, p-X-Phe, Phe, β -Nal, Acc, Cha, Aib or is deleted;
A¹⁹ is Glu, Aib or is deleted;
A²⁰ is Arg, Lys, HN-CH((CH₂)_nNH-R⁴)-C(O) or is deleted;
A²¹ is Val, Leu, Ile, Phe, Nle, β -Nal, Aib, p-X-Phe, Acc, Cha, Met or is deleted;
5 A²² is Acc, Aib, Glu or is deleted;
A²³ is Trp, Acc, Phe, p-X-Phe, Aib, β -Nal or Cha;
A²⁴ is Leu, Acc, Ile, Val, Phe, β -Nal, Nle, Aib, p-X-Phe or Cha;
A²⁵ is Arg, Lys or HN-CH((CH₂)_nNH-R⁴)-C(O);
A²⁶ is Arg, Lys or HN-CH((CH₂)_nNH-R⁴)-C(O);
10 A²⁷ is Lys, Aib, Leu, hArg, Gln, Acc, Arg, Cha, Nle, Ile, Val, Phe, β -Nal, or p-X-Phe, where the Lys is optionally substituted on the ϵ -amino group by an acyl group;
A²⁸ is Leu, Acc, Cha, Ile, Val, Phe, Nle, β -Nal, Aib or p-X-Phe;
A²⁹ is Gln, Acc or Aib;
A³⁰ is Asp, Lys, Arg or is deleted;
15 A³¹ is Val, Leu, Nle, Acc, Cha, Phe, Ile, β -Nal Aib, p-X-Phe or is deleted;
A³² is His or is deleted;
A³³ is Asn or is deleted;
A³⁴ is Phe, Tyr, Amp, Aib, β -Nal, Cha, Nle, Leu, Ile, Acc, p-X-Phe or is deleted;
A³⁵ is Val, Leu, Nle, Acc, Cha, Phe, Ile, β -Nal Aib, p-X-Phe or is deleted;
20 A³⁶ is Ala, Val, Aib, Acc, Nva, Abu or is deleted;
A³⁷ is Leu, Val, Nle, Ile, Cha, β -Nal, Trp, Pal, Acc, Phe, p-X-Phe, a lipophilic amino acid, or is deleted;
A³⁸ is Gly, Acc, Aib, or is deleted;
25 where X for each occurrence is independently selected from the group consisting of OH, a halo and CH₃;
R¹ and R² are each independently selected from the group consisting of H, (C₁₋₃₀)alkyl, (C₂₋₃₀)alkenyl, phenyl-(C₁₋₃₀)alkyl, naphthyl(C₁₋₃₀)alkyl, hydroxy(C₁₋₃₀)alkyl, hydroxy(C₂₋₃₀)alkenyl, hydroxy-phenyl(C₁₋₃₀)alkyl or hydroxy-naphthyl(C₁₋₃₀)alkyl;
30 or one of R¹ or R² is COE¹ where E¹ is (C₁₋₃₀)alkyl, (C₂₋₃₀)alkenyl, phenyl(C₁₋₃₀)alkyl, naphthyl(C₁₋₃₀)alkyl, hydroxy(C₁₋₃₀)alkyl, hydroxy(C₂₋₃₀)alkenyl, hydroxy-phenyl(C₁₋₃₀)alkyl or hydroxy-naphthyl(C₁₋₃₀)alkyl;
R³ is OH, NH₂, (C₁₋₃₀)alkoxy or NH-Y-CH₂-Z, where Y is a (C₁₋₃₀)hydrocarbon moiety and Z is CO₂H or CONH₂;
35 n for each occurrence is independently an integer from 1 to 5; and

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R⁴ for each occurrence is independently (C₁-C₃₀)alkyl, (C₁-C₃₀)acyl or -C((NH)(NH₂));

provided that the compound is not PTH(1-34)R³, PTH(1-35)R³, PTH(1-36)R³, PTH(1-37)R³, or PTH(1-38)R³.

5 10 A compound of the formula (III),

(R¹R²)-A¹-A²-A³-A⁴-A⁵-A⁶-A⁷-A⁸-A⁹-A¹⁰-A¹¹-A¹²-A¹³-A¹⁴-A¹⁵-A¹⁶-A¹⁷-A¹⁸-A¹⁹-A²⁰-A²¹-A²²-A²³-A²⁴-A²⁵-A²⁶-A²⁷-A²⁸-A²⁹-A³⁰-A³¹-A³²-A³³-A³⁴-A³⁵-A³⁶-A³⁷-A³⁸-R³,

(III)

or a pharmaceutically-acceptable salt thereof wherein

10 A¹ is Ser, Ala, Dap, Thr, Aib or is deleted;
 A² is Val, Leu, Ile, Phe, Nle, β -Nal, Aib, p-X-Phe, Acc, Cha, Met or is deleted;
 A³ is Ser, Thr, Aib or is deleted;
 A⁴ is Glu, Asp or is deleted;
 A⁵ is Leu, Val, Nle, Ile, Cha, β -Nal, Trp, Pal, Acc, Phe, p-X-Phe or is deleted;
 15 A⁶ is Gln, a hydrophilic amino acid or is deleted;
 A⁷ is Leu, Val, Nle, Ile, Cha, β -Nal, Trp, Pal, Acc, Phe, p-X-Phe, a lipophilic amino acid, or is deleted;
 A⁸ is Met, Nva, Leu, Val, Ile, Cha, Acc, Nle, p-X-Phe, Phe, β -Nal, Bpa, a lipophilic amino acid or is deleted;
 20 A⁹ is His, a hydrophilic amino acid or is deleted;
 A¹⁰ is Asn, a hydrophilic amino acid or is deleted;
 A¹¹ is Leu, Val, Nle, Ile, Cha, β -Nal, Trp, Pal, Acc, Phe, p-X-Phe, a hydrophilic amino acid or is deleted;
 A¹² is Gly, Acc, Aib, or is deleted;
 25 A¹³ is Lys, Arg or HN-CH((CH₂)_nNH-R⁴)-C(O);
 A¹⁴ is His or is deleted;
 A¹⁵ is Leu, Val, Nle, Ile, Cha, β -Nal, Trp, Pal, Acc, Phe, p-X-Phe or is deleted;
 A¹⁶ is Ser, Asn, Ala, Aib or is deleted;
 A¹⁷ is Ser, Thr, Aib or is deleted;
 30 A¹⁸ is Met, Nva, Leu, Val, Ile, Nle, p-X-Phe, Phe, β -Nal, Acc, Cha, Aib or is deleted;
 A¹⁹ is Glu, Aib or is deleted;
 A²⁰ is Arg, Lys, HN-CH((CH₂)_nNH-R⁴)-C(O) or is deleted;
 A²¹ is Val, Leu, Ile, Phe, Nle, β -Nal, Aib, p-X-Phe, Acc, Cha, Met or is deleted;
 A²² is Acc, Aib, Glu or is deleted;
 35 A²³ is Trp, Acc, Phe, p-X-Phe, Aib, β -Nal or Cha;

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A²⁴ is Leu, Acc, Ile, Val, Phe, β -Nal, Nle, Aib, p-X-Phe or Cha;

A²⁵ is Arg, Lys or HN-CH((CH₂)_nNH-R⁴)-C(O);

A²⁶ is Arg, Lys or HN-CH((CH₂)_nNH-R⁴)-C(O);

A²⁷ is Lys, Aib, Leu, hArg, Gln, Acc, Arg, Cha, Nle, Ile, Val, Phe, β -Nal, or p-X-Phe,

5 where the Lys is optionally substituted on the ϵ -amino group by an acyl group;

A²⁸ is Leu, Acc, Cha, Ile, Val, Phe, Nle, β -Nal, Aib or p-X-Phe;

A²⁹ is Gln, Acc or Aib;

A³⁰ is Asp, Lys, Arg or is deleted;

A³¹ is Val, Leu, Nle, Acc, Cha, Phe, Ile, β -Nal Aib, p-X-Phe or is deleted;

10 A³² is His or is deleted;

A³³ is Asn or is deleted;

A³⁴ is Phe, Tyr, Amp, Aib, β -Nal, Cha, Nle, Leu, Ile, Acc, p-X-Phe or is deleted;

A³⁵ is Val, Leu, Nle, Acc, Cha, Phe, Ile, β -Nal Aib, p-X-Phe or is deleted;

A³⁶ is Ala, Val, Aib, Acc, Nva, Abu or is deleted;

15 A³⁷ is Leu, Val, Nle, Ile, Cha, β -Nal, Trp, Pal, Acc, Phe, p-X-Phe, a lipophilic amino acid, or is deleted;

A³⁸ is Gly, Acc, Aib, or is deleted;

20 where X for each occurrence is independently selected from the group consisting of OH, a halo and CH₃;

R¹ and R² are each independently selected from the group consisting of H, (C₁₋₃₀)alkyl, (C₂₋₃₀)alkenyl, phenyl-(C₁₋₃₀)alkyl, naphthyl(C₁₋₃₀)alkyl, hydroxy(C₁₋₃₀)alkyl, hydroxy(C₂₋₃₀)alkenyl, hydroxy-phenyl(C₁₋₃₀)alkyl or hydroxy-naphthyl(C₁₋₃₀)alkyl;

25 or one of R¹ or R² is COE¹ where E¹ is (C₁₋₃₀)alkyl, (C₂₋₃₀)alkenyl, phenyl(C₁₋₃₀)alkyl, naphthyl(C₁₋₃₀)alkyl, hydroxy(C₁₋₃₀)alkyl, hydroxy(C₂₋₃₀)alkenyl, hydroxy-phenyl(C₁₋₃₀)alkyl or hydroxy-naphthyl(C₁₋₃₀)alkyl;

R³ is OH, NH₂, (C₁₋₃₀)alkoxy or NH-Y-CH₂-Z, where Y is a (C₁₋₃₀)hydrocarbon moiety and Z is CO₂H or CONH₂;

n for each occurrence is independently an integer from 1 to 5; and

30 R⁴ for each occurrence is independently (C_{1-C₃₀})alkyl, (C_{1-C₃₀})acyl or -C((NH)(NH₂));

provided that when A⁸ is not a lipophilic D-amino acid or is not deleted then at least one of A⁶, A⁷, A⁹, A¹⁰, A¹¹ and A¹² is a D-amino acid or at least one of A⁶, A⁷, A⁹, A¹⁰, A¹¹, A¹², A¹³, A¹⁴, A¹⁵, A¹⁶, A¹⁷, A¹⁸, A¹⁹, A²⁰, A²¹ and A²² is deleted;

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and further provided that when the compound contains a D-amino acid then A³⁶ is deleted.

11. A compound according to claim 10 wherein said compound is

[D-Nle⁸, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂,

5 [D-Nle⁸]hPTH(1-34)NH₂,

[D-Leu⁸, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂,

[D-Cha⁸, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂,

[D-Phe⁸, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂,

[D-Nal⁸, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂,

10 [D-Abu⁸, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂,

[D-Met⁸]hPTH(1-34)NH₂,

[Cha^{7..11}, D-Met⁸]hPTH(1-34)NH₂,

[D-Ile⁸]hPTH(1-34)NH₂,

[Cha^{7..11}, D-Ile⁸, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂,

15 [D-Ile⁸, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂,

[D-Leu⁸]hPTH(1-34)NH₂,

[Cha^{7..11}, D-Leu⁸, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂,

[D-Val⁸]hPTH(1-34)NH₂,

[Cha^{7..11}, D-Val⁸, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂,

20 [D-Val⁸, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂,

[D-Cha⁸]hPTH(1-34)NH₂,

[Cha^{7..11}, D-Cha⁸, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂,

[D-Ala⁸]hPTH(1-34)NH₂,

[Cha^{7..11}, D-Ala⁸, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂,

25 [D-Ala⁸, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂,

[D-Phe⁸]hPTH(1-34)NH₂,

[Cha^{7..11}, D-Phe⁸, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂,

[D-Nal⁸]hPTH(1-34)NH₂,

[D-Trp⁸]hPTH(1-34)NH₂,

30 [Cha^{7..11}, D-Trp⁸, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂,

[D-Trp⁸, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂,

[D-Abu⁸]hPTH(1-34)NH₂,

[Cha^{7..11}, D-Abu⁸, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂,

[D-Nle⁸, Nle¹⁸]hPTH(1-34)NH₂,

35 [des-Met⁸]hPTH(1-34)NH₂,

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[Cha^{1.11}, des-Met⁸]hPTH(1-34)NH₂,
[Cha^{7.11}, des-Met⁸, des-Met¹⁸, Tyr³⁴]hPTH(1-34)NH₂,
[des-Met⁸, des-Met¹⁸]hPTH(1-34)NH₂,
[Cha^{7.11}, des-Met⁸, des-Met¹⁸]hPTH(1-34)NH₂,

5 [des-Met⁸, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂,
[des-Met¹⁸]hPTH(1-34)NH₂,
[Cha^{7.11}, des-Met¹⁸]hPTH(1-34)NH₂,
[Cha^{7.11}, des-Met¹⁸, Tyr³⁴]hPTH(1-34)NH₂,
[D-Nle⁸, des-Met¹⁸, Tyr³⁴]hPTH(1-34)NH₂,

10 [des-Glu⁶, Nle^{8.18}, Tyr³⁴]hPTH(1-34)NH₂,
[des-Leu⁷, Nle^{8.18}, Tyr³⁴]hPTH(1-34)NH₂,
[des-His⁹, Nle^{8.18}, Tyr³⁴]hPTH(1-34)NH₂,
[des-Asn¹⁰, Nle^{8.18}, Tyr³⁴]hPTH(1-34)NH₂,
[des-Leu¹¹, Nle^{8.18}, Tyr³⁴]hPTH(1-34)NH₂,

15 [des-Gly¹², Nle^{8.18}, Tyr³⁴]hPTH(1-34)NH₂,
[des-Lys¹³, Nle^{8.18}, Tyr³⁴]hPTH(1-34)NH₂,
[des-His¹⁴, Nle^{8.18}, Tyr³⁴]hPTH(1-34)NH₂,
[des-Leu¹⁵, Nle^{8.18}, Tyr³⁴]hPTH(1-34)NH₂,
[des-Asn¹⁶, Nle^{8.18}, Tyr³⁴]hPTH(1-34)NH₂,

20 [des-Ser¹⁷, Nle^{8.18}, Tyr³⁴]hPTH(1-34)NH₂,
[des-Glu¹⁹, Nle^{8.18}, Tyr³⁴]hPTH(1-34)NH₂,
[des-Arg²⁰, Nle^{8.18}, Tyr³⁴]hPTH(1-34)NH₂,
[des-Val²¹, Nle^{8.18}, Tyr³⁴]hPTH(1-34)NH₂,
[des-Glu²², Nle^{8.18}, Tyr³⁴]hPTH(1-34)NH₂,

25 [des-Glu⁶, Cha^{7.11}, Nle^{8.18}, Tyr³⁴]hPTH(1-34)NH₂,
[des-Leu⁷, Nle^{8.18}, Cha¹¹, Tyr³⁴]hPTH(1-34)NH₂,
[Cha^{7.11}, des-His⁹, Nle^{8.18}, Tyr³⁴]hPTH(1-34)NH₂,
[des-Glu⁶, Cha^{7.11}, D-Nle⁸, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂,
[des-Leu⁷, D-Nle⁸, Cha¹¹, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂,

30 [Cha^{7.11}, D-Nle⁸, des-His⁹, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂,
[Cha^{7.11}, D-Nle⁸, Nle¹⁸, Tyr³⁴]hPTH(1-31)NH₂,
[Cha^{7.11}, des-Met⁸, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂,
[Cha^{7.11}, D-Nle⁸, des-Met¹⁸, Tyr³⁴]hPTH(1-34)NH₂,
[Cha^{7.11}, des-Met⁸, des-His⁹, des-Asn¹⁰]hPTH(1-34)NH₂,

35 [Cha^{7.11}, des-Ser¹⁷, des-Met¹⁸, des-Glu¹⁹]hPTH(1-34)NH₂,

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[D-Met⁸, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂,

[D-Met⁸, Tyr³⁴]hPTH(1-34)NH₂,

[D-Bpa⁸, Tyr³⁴]hPTH(1-34)NH₂,

[D-Nle⁸, Nle¹⁸, Tyr³⁴]hPTH(7-34)NH₂,

5 [D-Nle⁸, Nle¹⁸]hPTH(7-34)NH₂ or

[D-Met⁸]hPTH(7-34)NH₂.

12. A compound according to claim 11 wherein said compound is

[Cha^{7,11}, des-Met⁸, Nle¹⁸, Tyr³⁴]hPTH-(1-34)NH₂,

[Cha^{7,11}, D-Nle⁸, des-Met¹⁸, Tyr³⁴]hPTH-(1-34)NH₂,

10 [Cha^{7,11}, D-Nle⁸, Nle¹⁸, Tyr³⁴]hPTH-(1-34)NH₂,

[D-Nle⁸, Nle¹⁸, Tyr³⁴]hPTH(1-34)NH₂ or [D-Bpa⁸, Tyr³⁴]hPTH(1-34)NH₂.

13. APThrP analogue of formula (IV) that selectively binds to the PTH2

receptor,

(R¹R²)-A¹-A²-A³-A⁴-A⁵-A⁶-A⁷-A⁸-A⁹-A¹⁰-A¹¹-A¹²-A¹³-A¹⁴-A¹⁵-A¹⁶-A¹⁷-A¹⁸-A¹⁹-A²⁰-A²¹-A²²-A²³-

15 A²⁴-A²⁵-A²⁶-A²⁷-A²⁸-A²⁹-A³⁰-A³¹-A³²-A³³-A³⁴-A³⁵-A³⁶-A³⁷-A³⁸-R³,

(IV)

or a pharmaceutically acceptable salt thereof, wherein

A¹ is Ala, Ser, Dap, Thr, Aib or is deleted;

A² is Val or is deleted;

20 A³ is Ser, Aib, Thr or is deleted;

A⁴ is Glu, Asp or is deleted;

A⁵ is His, Ile, Acc, Val, Nle, Phe, Leu, p-X-Phe, β -Nal, Aib, Cha or is deleted;

A⁶ is Gln, a hydrophilic amino acid or is deleted;

25 A⁷ is Leu, Val, Cha, Nle, β -Nal, Trp, Pal, Acc, Phe, p-X-Phe, Aib, a lipophilic amino acid or is deleted;

A⁸ is Leu, Met, Acc, Cha, Aib, Nle, Phe, Ile, Val, β -Nal, p-X-Phe, a lipophilic amino acid or is deleted;

A⁹ is His, a hydrophilic amino acid or is deleted;

A¹⁰ is Asp, Asn, a hydrophilic amino acid or is deleted;

30 A¹¹ is Lys, Arg, Leu, Cha, Aib, p-X-Phe, Ile, Val, Nle, Acc, Phe, β -Nal, HN-CH((CH₂)_nNH-R⁴)-C(O), a lipophilic D-amino acid, a hydrophilic amino acid or is deleted;

A¹² is Gly, Acc, Aib or is deleted;

A¹³ is Lys, Arg, HN-CH((CH₂)_nNH-R⁴)-C(O) or is deleted;

35 A¹⁴ is Ser, His or is deleted;

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A¹⁵ is Ile, Acc, Cha, Leu, Phe, Nle, β -Nal, Trp, p-X-Phe, Val, Aib or is deleted;

A¹⁶ is Gln, Aib or is deleted;

A¹⁷ is Asp, Aib or is deleted;

A¹⁸ is Leu, Aib, Acc, Cha, Phe, Ile, Nle, β -Nal, Val, p-X-Phe or is deleted;

5 A¹⁹ is Arg, Lys, Aib, HN-CH((CH₂)_nNH-R⁴)-C(O) or is deleted;

A²⁰ is Arg, Lys, HN-CH((CH₂)_nNH-R⁴)-C(O) or is deleted;

A²¹ is Arg, Lys, HN-CH((CH₂)_nNH-R⁴)-C(O) or is deleted;

A²² is Phe, Glu, Aib, Acc, p-X-Phe, β -Nal, Val, Leu, Ile, Nle or Cha;

A²³ is Phe, Leu, Lys, Acc, Cha, β -Nal, Aib, Nle, Ile, p-X-Phe, Val or Trp;

10 A²⁴ is Leu, Lys, Acc, Nle, Ile, Val, Phe, β -Nal, Aib, p-X-Phe, Arg or Cha;

A²⁵ is His, Lys, Aib, Acc, Arg or Glu;

A²⁶ is His, Aib, Acc, Arg or Lys;

A²⁷ is Leu, Lys, Acc, Arg, Ile, Val, Phe, Aib, Nle, β -Nal, p-X-Phe or Cha;

A²⁸ is Ile, Leu, Lys, Acc, Cha, Val, Phe, p-X-Phe, Nle, β -Nal, Aib or is deleted;

15 A²⁹ is Ala, Glu, Acc, Aib or is deleted;

A³⁰ is Glu, Leu, Nle, Cha, Aib, Acc, Lys, Arg or is deleted;

A³¹ is Ile, Leu, Cha, Lys, Acc, Phe, Val, Nle, β -Nal, Arg or is deleted;

A³² is His or is deleted;

A³³ is Thr, Ser or is deleted;

20 A³⁴ is Ala, Phe, Tyr, Cha, Val, Ile, Leu, Nle, β -Nal, Aib, Acc or is deleted;

A³⁵ is Glu, Asp or is deleted;

A³⁶ is Ile, Acc, Cha, Leu, Phe, Nle, β -Nal, Trp, p-X-Phe, Val, Aib or is deleted;

A³⁷ is Arg, Lys, HN-CH((CH₂)_nNH-R⁴)-C(O) or is deleted;

A³⁸ is Ala, Phe, Tyr, Cha, Val, Ile, Leu, Nle, β -Nal, Aib, Acc or is deleted;

25 R¹ and R² are each independently selected from the group consisting of H, (C₁₋₃₀)alkyl, (C₂₋₃₀)alkenyl, phenyl-(C₁₋₃₀)alkyl, naphthyl(C₁₋₃₀)alkyl, hydroxy(C₁₋₃₀)alkyl, hydroxy(C₂₋₃₀)alkenyl, hydroxy-phenyl(C₁₋₃₀)alkyl or hydroxy-naphthyl(C₁₋₃₀)alkyl;

or one of R¹ or R² is COE¹ where E¹ is (C₁₋₃₀)alkyl, (C₂₋₃₀)alkenyl, phenyl(C₁₋₃₀)alkyl, naphthyl(C₁₋₃₀)alkyl, hydroxy(C₁₋₃₀)alkyl, hydroxy(C₂₋₃₀)alkenyl, hydroxy-phenyl(C₁₋₃₀)alkyl or hydroxy-naphthyl(C₁₋₃₀)alkyl;

30 R³ is OH, NH₂, (C₁₋₃₀)alkoxy or NH-Y-CH₂-Z, where Y is a (C₁₋₃₀)hydrocarbon moiety and Z is CO₂H or CONH₂;

n for each occurrence is independently an integer from 1 to 5; and

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R^4 for each occurrence is independently (C_1 - C_{30})alkyl, (C_1 - C_{30})acyl or -C(NH)(NH₂));

provided that the compound is not PTHrP(1-34)R³, PTHrP(1-35)R³, PTHrP(1-36)R³, PTHrP(1-37)R³ or PTHrP(1-38)R³,

5 and further provided that the compound is not [Ile⁵, Trp²³]PTHrP(1-36) or [Trp²³]PTHrP(1-36).

14 A compound of formula (V),

(R¹R²)-A¹-A²-A³-A⁴-A⁵-A⁶-A⁷-A⁸-A⁹-A¹⁰-A¹¹-A¹²-A¹³-A¹⁴-A¹⁵-A¹⁶-A¹⁷-A¹⁸-A¹⁹-A²⁰-A²¹-A²²-A²³-A²⁴-A²⁵-A²⁶-A²⁷-A²⁸-A²⁹-A³⁰-A³¹-A³²-A³³-A³⁴-A³⁵-A³⁶-A³⁷-A³⁸-R³,

10 (V)

or a pharmaceutically acceptable salt thereof, wherein

A¹ is Ala, Ser, Dap, Thr, Aib or is deleted;

A² is Val or is deleted;

A³ is Ser, Aib, Thr or is deleted;

15 A⁴ is Glu, Asp or is deleted;

A⁵ is His, Ile, Acc, Val, Nle, Phe, Leu, p-X-Phe, β -Nal, Aib, Cha or is deleted;

A⁶ is Gln, a hydrophilic amino acid or is deleted;

A⁷ is Leu, Val, Cha, Nle, β -Nal, Trp, Pal, Acc, Phe, p-X-Phe, Aib, a lipophilic amino acid or is deleted;

20 A⁸ is Leu, Met, Acc, Cha, Aib, Nle, Phe, Ile, Val, β -Nal, p-X-Phe, a lipophilic amino acid or is deleted;

A⁹ is His, a hydrophilic amino acid or is deleted;

A¹⁰ is Asp, Asn, a hydrophilic amino acid or is deleted;

25 A¹¹ is Lys, Arg, Leu, Cha, Aib, p-X-Phe, Ile, Val, Nle, Acc, Phe, β -Nal, HN-CH((CH₂)_nNH-R⁴)-C(O), a lipophilic D-amino acid, a hydrophilic amino acid or is deleted;

A¹² is Gly, Acc, Aib or is deleted;

A¹³ is Lys, Arg, HN-CH((CH₂)_nNH-R⁴)-C(O) or is deleted;

A¹⁴ is Ser, His or is deleted;

30 A¹⁵ is Ile, Acc, Cha, Leu, Phe, Nle, β -Nal, Trp, p-X-Phe, Val, Aib or is deleted;

A¹⁶ is Gln, Aib or is deleted;

A¹⁷ is Asp, Aib or is deleted;

A¹⁸ is Leu, Aib, Acc, Cha, Phe, Ile, Nle, β -Nal, Val, p-X-Phe or is deleted;

A¹⁹ is Arg, Lys, Aib, HN-CH((CH₂)_nNH-R⁴)-C(O) or is deleted;

35 A²⁰ is Arg, Lys, HN-CH((CH₂)_nNH-R⁴)-C(O) or is deleted;

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A²¹ is Arg, Lys, HN-CH((CH₂)_nNH-R⁴)-C(O) or is deleted;

A²² is Phe, Glu, Aib, Acc, p-X-Phe, β -Nal, Val, Leu, Ile, Nle or Cha;

A²³ is Phe, Leu, Lys, Acc, Cha, β -Nal, Aib, Nle, Ile, p-X-Phe, Val or Trp;

A²⁴ is Leu, Lys, Acc, Nle, Ile, Val, Phe, β -Nal, Aib, p-X-Phe, Arg or Cha;

5 A²⁵ is His, Lys, Aib, Acc, Arg or Glu;

A²⁶ is His, Aib, Acc, Arg or Lys;

A²⁷ is Leu, Lys, Acc, Arg, Ile, Val, Phe, Aib, Nle, β -Nal, p-X-Phe or Cha;

A²⁸ is Ile, Leu, Lys, Acc, Cha, Val, Phe, p-X-Phe, Nle, β -Nal, Aib or is deleted;

A²⁹ is Ala, Glu, Acc, Aib or is deleted;

10 A³⁰ is Glu, Leu, Nle, Cha, Aib, Acc, Lys, Arg or is deleted;

A³¹ is Ile, Leu, Cha, Lys, Acc, Phe, Val, Nle, β -Nal, Arg or is deleted;

A³² is His or is deleted;

A³³ is Thr, Ser or is deleted;

A³⁴ is Ala, Phe, Tyr, Cha, Val, Ile, Leu, Nle, β -Nal, Aib, Acc or is deleted;

15 A³⁵ is Glu, Asp or is deleted;

A³⁶ is Ile, Acc, Cha, Leu, Phe, Nle, β -Nal, Trp, p-X-Phe, Val, Aib or is deleted;

A³⁷ is Arg, Lys, HN-CH((CH₂)_nNH-R⁴)-C(O) or is deleted;

A³⁸ is Ala, Phe, Tyr, Cha, Val, Ile, Leu, Nle, β -Nal, Aib, Acc or is deleted;

20 R¹ and R² are each independently selected from the group consisting of H, (C₁₋₃₀)alkyl, (C₂₋₃₀)alkenyl, phenyl-(C₁₋₃₀)alkyl, naphthyl(C₁₋₃₀)alkyl, hydroxy(C₁₋₃₀)alkyl, hydroxy(C₂₋₃₀)alkenyl, hydroxy-phenyl(C₁₋₃₀)alkyl or hydroxy-naphthyl(C₁₋₃₀)alkyl;

25 or one of R¹ or R² is COE¹ where E¹ is (C₁₋₃₀)alkyl, (C₂₋₃₀)alkenyl, phenyl(C₁₋₃₀)alkyl, naphthyl(C₁₋₃₀)alkyl, hydroxy(C₁₋₃₀)alkyl, hydroxy(C₂₋₃₀)alkenyl, hydroxy-phenyl(C₁₋₃₀)alkyl or hydroxy-naphthyl(C₁₋₃₀)alkyl;

R³ is OH, NH₂, (C₁₋₃₀)alkoxy or NH-Y-CH₂-Z, where Y is a (C₁₋₃₀)hydrocarbon moiety and Z is CO₂H or CONH₂;

n for each occurrence is independently an integer from 1 to 5; and

30 R⁴ for each occurrence is independently (C_{1-C₃₀})alkyl, (C_{1-C₃₀})acyl or -C((NH)(NH₂));

provided that when A⁸ is not a lipophilic D-amino acid or is not deleted then at least one of A⁶, A⁷, A⁹, A¹⁰, A¹¹ and A¹² is a D-amino acid or at least one of A⁶, A⁷, A⁹, A¹⁰, A¹¹, A¹², A¹³, A¹⁴, A¹⁵, A¹⁶, A¹⁷, A¹⁸, A¹⁹, A²⁰, A²¹ and A²² is deleted.

15. A compound according to claim 14 wherein said compound is

35 [Ile⁵, D-Leu⁸]hPThrP(1-34)NH₂,

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[Ile⁵, D-Leu⁸, Trp²³]hPTHrP(1-34)NH₂,
[Ile⁵, des-Leu⁸, Trp²³]hPTHrP(1-34)NH₂,
[Ile⁵, des-Leu⁸]hPTHrP(1-34)NH₂,
[des-Leu⁸, Trp²³]hPTHrP(1-34)NH₂,
5 [Ile⁵, des-Leu¹⁸]hPTHrP(1-34)NH₂,
[Ile⁵, des-Leu¹⁸, Trp²³]hPTHrP(1-34)NH₂,
[des-Leu¹⁸, Trp²³]hPTHrP(1-34)NH₂,
[Ile⁵, D-Leu⁸, Glu^{22,25}, Leu^{23,28,31}, Lys^{26,30}, Aib²⁹]hPTHrP(1-34)NH₂,
[Ile⁵, D-Leu⁸, Glu^{22,25}, Trp²³, Lys^{26,30}, Leu^{28,31}, Aib²⁹]hPTHrP(1-34)NH₂,
10 [Ile⁵, D-Leu⁸, Glu^{22,25,29}, Leu^{23,28,31}, Lys^{26,30}]hPTHrP(1-34)NH₂,
[Ile⁵, D-Leu⁸, Glu^{22,25,29}, Trp²³, Lys^{26,30}, Leu^{28,31}]hPTHrP(1-34)NH₂ or
[D-Leu⁸, Trp²³]hPTHrP(7-34)NH₂.

16. A method of selectively binding the PTH2 receptor which comprises administering to a patient in need thereof an analogue according to claim 9 or a pharmaceutically acceptable salt thereof.

17. A method of selectively binding the PTH2 receptor which comprises administering to a patient in need thereof a compound according to claim 10 or a pharmaceutically acceptable salt thereof.

18. A method of selectively binding the PTH2 receptor which comprises administering to a patient in need thereof a compound according to claim 11 or a pharmaceutically acceptable salt thereof.

19. A method of selectively binding a PTH2 receptor which comprises administering to a patient in need thereof a compound according to claim 12 or a pharmaceutically acceptable salt thereof.

20. A method of selectively binding a PTH2 receptor which comprises administering to a patient in need thereof an analogue according to claim 13 or a pharmaceutically acceptable salt thereof.

21. A method of selectively binding a PTH2 receptor which comprises administering to a patient in need thereof a compound according to claim 14 or a pharmaceutically acceptable salt thereof.

22. A method of selectively binding a PTH2 receptor which comprises administering to a patient in need thereof a compound according to claim 15 or a pharmaceutically acceptable salt thereof.

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23. A pharmaceutical composition comprising an analogue according to claim 9 or a pharmaceutically acceptable salt thereof and a pharmaceutically acceptable carrier.

24. A pharmaceutical composition comprising a compound according to claim 10 or a pharmaceutically acceptable salt thereof and a pharmaceutically acceptable carrier.

25. A pharmaceutical composition comprising a compound according to claim 11 or a pharmaceutically acceptable salt thereof and a pharmaceutically acceptable carrier.

26. A pharmaceutical composition comprising a compound according to claim 12 or a pharmaceutically acceptable salt thereof and a pharmaceutically acceptable carrier.

27. A pharmaceutical composition comprising an analogue according to claim 13 or a pharmaceutically acceptable salt thereof and a pharmaceutically acceptable carrier.

28. A pharmaceutical composition comprising a compound according to claim 14 or a pharmaceutically acceptable salt thereof and a pharmaceutically acceptable carrier.

29. A pharmaceutical composition comprising a compound according to claim 15 or a pharmaceutically acceptable salt thereof and a pharmaceutically acceptable carrier.

30. A method of treating a medical disorder that results from altered or excessive action of the PTH2 receptor, which comprises administering to a patient in need thereof an effective amount of an analogue according to claim 7, sufficient to inhibit the activation of the PTH2 receptor of said patient.

31. A method of treating a medical disorder that results from altered or excessive action of the PTH2 receptor, which comprises administering to a patient in need thereof an effective amount of an analogue according to claim 9, sufficient to inhibit the activation of the PTH2 receptor of said patient.

32. A method of treating a medical disorder that results from altered or excessive action of the PTH2 receptor, which comprises administering to a patient in need thereof an effective amount of a compound according to claim 10, sufficient to inhibit the activation of the PTH2 receptor of said patient.

33. A method of treating a medical disorder that results from altered or excessive action of the PTH2 receptor, which comprises administering to a patient in

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need thereof an effective amount of a compound according to claim 11, sufficient to inhibit the activation of the PTH2 receptor of said patient.

34. A method of treating a medical disorder that results from altered or excessive action of the PTH2 receptor, which comprises administering to a patient in

5 need thereof an effective amount of a compound according to claim 12, sufficient to inhibit the activation of the PTH2 receptor of said patient.

35. A method of treating a medical disorder that results from altered or excessive action of the PTH2 receptor, which comprises administering to a patient in need thereof an effective amount of an analogue according to claim 13, sufficient to

10 inhibit the activation of the PTH2 receptor of said patient.

36. A method of treating a medical disorder that results from altered or excessive action of the PTH2 receptor, which comprises administering to a patient in need thereof an effective amount of a compound according to claim 14, sufficient to inhibit the activation of the PTH2 receptor of said patient.

15 37. A method of treating a medical disorder that results from altered or excessive action of the PTH2 receptor, which comprises administering to a patient in need thereof an effective amount of a compound according to claim 15, sufficient to inhibit the activation of the PTH2 receptor of said patient.

20 38. A method according to claim 30 wherein said medical disorder is abnormal CNS functions, abnormal pancreatic functions, divergence from normal mineral metabolism and homeostasis, male infertility, abnormal blood pressure or a hypothalmic disease.

25 39. A method according to claim 31 wherein said medical disorder is abnormal CNS functions, abnormal pancreatic functions, divergence from normal mineral metabolism and homeostasis, male infertility, abnormal blood pressure or a hypothalmic disease.

40. A method according to claim 32 wherein said medical disorder is abnormal CNS functions, abnormal pancreatic functions, divergence from normal mineral metabolism and homeostasis, male infertility, abnormal blood pressure or a

30 hypothalmic disease.

41. A method according to claim 33 wherein said medical disorder is abnormal CNS functions, abnormal pancreatic functions, divergence from normal mineral metabolism and homeostasis, male infertility, abnormal blood pressure or a hypothalmic disease.

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42. A method according to claim 34 wherein said medical disorder is abnormal CNS functions, abnormal pancreatic functions, divergence from normal mineral metabolism and homeostasis, male infertility, abnormal blood pressure or a hypothalmic disease.

5 43. A method according to claim 35 wherein said medical disorder is abnormal CNS functions, abnormal pancreatic functions, divergence from normal mineral metabolism and homeostasis, male infertility, abnormal blood pressure or a hypothalmic disease.

10 44. A method according to claim 36 wherein said medical disorder is abnormal CNS functions, abnormal pancreatic functions, divergence from normal mineral metabolism and homeostasis, male infertility, abnormal blood pressure or a hypothalmic disease.

15 45. A method according to claim 37 wherein said medical disorder is abnormal CNS functions, abnormal pancreatic functions, divergence from normal mineral metabolism and homeostasis, male infertility, abnormal blood pressure or a hypothalmic disease.

20 46. A method of treating a medical disorder that results from altered or excessive action of the PTH2 receptor, which comprises administering to a patient in need thereof an effective amount of a PTH analogue or a truncated PTH analogue or a pharmaceutically acceptable salt thereof according to claim 1, sufficient to inhibit the activation of the PTH2 receptor of said patient.

25 47. A method according to claim 46 wherein said medical disorder is abnormal CNS functions, abnormal pancreatic functions, divergence from normal mineral metabolism and homeostasis, male infertility, abnormal blood pressure or a hypothalmic disease.